

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GARY E. GEORGESON and
LARRY E. DOLAN

Appeal No. 2001-0278
Application 09/069,002

ON BRIEF

Before WILLIAM F. SMITH, GARRIS, and MOORE Administrative Patent Judges.

MOORE, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from a final rejection of claim 10. Claim 11, although pending, is withdrawn from consideration.¹

¹ Claim 11 was subject to a restriction requirement. Although traversed, the restriction requirement was made final and the record reveals no petition was made for reconsideration. While the Appellants have argued that claim 11 should be retained in the application, the Appellants failed to pursue the correct remedy. We do not review this discretionary type of decision. See, e.g. See In re Mindick, 371 F.2d 892, 894, 152 USPQ 566, 568 (CCPA 1967) (if there is an abuse of discretion, the matter may be remedied by petition to the Commissioner of Patents; In re Pavlecka, 319 F.2d 180, 188, 138 USPQ 118, 125 (CCPA 1963) (procedural matter is outside board's jurisdiction).

REPRESENTATIVE CLAIM

Claims 10 reads as follow:

10. A method for forming a thermoplastic weld between at least two, fiber-reinforced composite laminates, comprising the steps of:

(a) assembling at least two laminates to define a bond line along faying surfaces of the laminates;

(b) positioning a susceptor along the bond line;

(c) heating the laminates along the bond line to weld the laminates together by heating the susceptor;

(d) nondestructively evaluating the weld quality by analyzing acoustic signals generated by electromagnetic pulses absorbed in the susceptor; and

(e) rewelding in at least those regions of the weld found to have inadequate strength.

THE REFERENCES

In rejecting the appealed claim under 35 U.S.C. §103, the Examiner relies on the following references:

Clark, Jr. et al. (Clark)	4,944,185	Jul. 31, 1990
Kodokian (Kodokian)	5,248,864	Sep. 28, 1993
Mittleider (Mittleider)	5,660,669	Aug. 26, 1997

THE REJECTIONS

Claim 10 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Kodokian in view of Clark.

Claim 10 stands rejected under 35 U.S.C. §103(a) as unpatentable over Kodokian in view of Clark and Mittleider.

SUMMARY OF DECISION\

On consideration of the entire record, we reverse the §103 rejection over Kodokian in view of Clark and affirm the §103 rejection over Kodokian in view of Clark and Mittleider.

DISCUSSION

The Invention

The Appellants' invention relates to a method for forming a thermoplastic weld between fiber reinforced composite laminates by heating the bond line using a susceptor, then nondestructively evaluating the weld using acoustic signals generated by electromagnetic pulse absorption by the susceptor, and rewelding in those areas found to have inadequate strength.

The Rejection over Kodokian in view of Clark

Claim 10 is rejected under 3 U.S.C. §103(a) as being unpatentable over Kodokian in view of Clark. For this rejection, the Examiner notes that claim 10 does not require rewelding if no defects are observed in the weld (Examiner's Answer, page 5, line 16 – page 6, line 1). The Appellants, on the other hand, state that the claimed process requires rewelding “[a]lthough the Examiner tries to ignore it” (Appeal Brief, page 6, line 9).

Federal Circuit precedent has provided guidance with respect to claim construction when reviewing claims on appeal. See, e.g. Burlington Industries v. Quigg, 822 F.2d 1581, 1583, 3 USPQ2d 1436, 1438 (Fed. Cir. 1987) (claims undergoing examination are given their broadest reasonable construction consistent with the

specification); In re Prater, 415 F.2d 1393, 1404 05, 162 USPQ 541, 550-51 (CCPA 1969).

Steps (d) and (e) of the instant claim reads as follows:

(d) nondestructively evaluating the weld quality by analyzing acoustic signals generated by electromagnetic pulses absorbed in the susceptor; and

(e) rewelding in at least those regions of the weld found to have inadequate strength.

The Appellants assert that the “Examiner cannot read step (e) out of the claim with the assertion that some welds might be of adequate strength everywhere when inspected. Claim 10 calls for rewelding in areas of inadequate strength” (Appeal Brief, page 7, lines 5 – 7). We agree.

Step (e) requires rewelding in “at least those regions found to have inadequate strength” (emphasis added). As noted by the Examiner, this begs the question, “what if no regions of inadequate strength are found?” Or, put another way, if a bond is acceptable the first time, would a nondestructive evaluation of the weld to determine this acceptability fall within the scope of claim 10? The Examiner states that it would. The Appellants state that it would not.

The Examiner’s reasoning is that if no regions require rewelding, then no rewelding is performed, and the literal language of limitation (e) is met. The Examiner’s position that at least occasionally a weld, when formed and analyzed, meets strength criterion and accordingly step (e) is not always required is quite reasonable.

However, the use of the words at least causes step (e) to require “at least” some rewelding. Accordingly, if no rewelding is performed, then the limitations of step (e) cannot be met. In other words, if step (d) analysis reveals no inadequate strength, no

rewelding would occur, and claim 10 would not be infringed. Additionally, if step (d) analysis reveals a region of inadequate strength, and the region is repaired, cured, or fixed in another manner other than rewelding, step (e) would not be met, and the claim would not be infringed.

Turning now to the references cited, the Appellants state “Kodokian does not suggest welding, evaluating welds, or rewelding to improve the strength of welds. Kodokian does not teach connecting composites, inspecting connected composites, ... or rewelding welds discovered to have inadequate strength.” (Appeal Brief, page 6, lines 13-16). The Appellants further observe, “Clark neither welds nor rewelds where inadequate strength is discovered.” (Appeal Brief, Page 6, lines 19-20)

While we disagree with much of the Appellants’ characterization of Kodokian (as discussed below), we do agree with the Appellants that neither Kodokian nor Clark disclosed or taught the rewelding of bonds having inadequate strength. Rewelding is a necessary element of the claim. Accordingly, we reverse this rejection of claim 10.

The Rejection over Kodokian in view of Clark further in view of Mittleider

However, Claim 10 is alternatively rejected by the Examiner under 35 U.S.C. §103(a) as being unpatentable over Kodokian in view of Clark and further in view of Mittleider.

Turning now in more detail to the applied references, the Examiner notes that Kodokian teaches the use of ferromagnetic susceptor particles embedded in a thermoplastic adhesive to bond fiber reinforced thermoplastic laminates (Examiner’s Answer, page 6, lines 3-5, citing Kodokian). Clark, it is said, teaches a nondestructive method for evaluating composite materials and adhesive bonds wherein ferromagnetic

particles are placed in the composite materials or an adhesive. The bonded article, it is said, is then caused to vibrate with electromagnetic energy absorbed by the particles and the vibration signature is analyzed to determine the quality of the bond (Examiner's Answer, page 6, lines 8-11).

Additionally, the Examiner states that "[a] part which is found to be defective or of inadequate strength must be either discarded or fixed. It is generally known to weld thermoplastic composite parts, nondestructively evaluate the welds, and reweld if unbonded regions are found" (Examiner's Answer, page 7, lines 12-14; citing Mittleider, column 19, lines 35-56). .

The Examiner then concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Clark's nondestructive evaluation method on the bonded laminates of Kodokian because one of ordinary skill would have been motivated to reduce the chances that a defective part is used in an end product; and to salvage the expensive composite materials rather than discard them. (Examiner's Answer, page 6, lines 15-18 and page 7, lines 15-17).

The Appellants state that:

Kodokian does not suggest welding, evaluating welds, or rewelding to improve the strength of welds. Kodokian does not teach connecting composites, inspecting connected composites (let alone the one Applicant claims in step (d)), or rewelding welds discovered to have inadequate strength. (Appeal Brief, page 6, lines 14-16).

and

Clark neither welds nor rewelds where inadequate strength is discovered. While Clark may be able to locate areas of inadequate bonding in adhesive bonds, he does not teach how to alleviate these areas of weakness.

Neither reference inputs an electromagnetic pulse in to the welded composite to excite the buried susceptor and then listens to the acoustic signal created by the excited susceptor. (Appeal Brief, page 6, lines 19-24).

These statements contain several inaccuracies.

Kodokian is relied upon by the Examiner to teach the use of ferromagnetic susceptor particles to bond fiber reinforced thermoplastic laminates. Such use is clearly disclosed at column 2, line 2 “bonding operations”; column 5, lines 33-62 (the entire laminate bonding operation of Example II); and in column 6 line 27 - column 7 line 7)(the bonding operations of Examples III and IV). While it may be literally true that the word “weld” is not used, it is clear that the bonding process accomplishes a weld by the temperatures involved. Kodokian, also contrary to the Appellants’ assertion, teaches the connection of composites in its Examples.

To the extent that Kodokian does not teach inspection or rewelding, the argument of the Appellants misses the point. The Kodokian reference is not relied upon for the teaching of inspection or rewelding. It is the Clark reference, which teaches inspection using “tagged particles.” The Appellants sidestep the disclosure in Clark that the “tagged particles” are ferromagnetic (see, e.g. Clark, column 3, lines 55 – 56), as are several of the disclosed Kodokian susceptor materials (Kodokian, Table II, especially columns 5-6).

The Appellants state that Clark discloses a method of qualitatively and nondestructively evaluating adhesive joints and locating areas of inadequate strength (Appeal Brief, page 6, lines 17-21). However, the Appellants argue that Clark neither welds nor rewelds where inadequate strength is found and does not teach how to repair inadequate strength and that “[n]either reference inputs an electromagnetic pulse into the welded composite to excite the buried susceptor and then listens to the acoustic signal created by the excited susceptor” (Appeal Brief, page 6, lines 22-24).

We also disagree with this interpretation of Clark. Clark does input electromagnetic pulses into a buried ferromagnetic particle susceptor material and receive an acoustic signal. See, e.g. Clark, Figures 3D, 3E, and 3F, and column 2, line 56 - column 3, line 5.

The test for obviousness involves consideration of what the combined teachings, as opposed to the individual teachings, of the references would suggest to those of ordinary skill in the art. In re Young, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991); In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). Merely because each individual reference lacks an element (the thrust of the Appellants' arguments) does not mean that when properly combined a prima facie case of obviousness has not been made out.

The Appellants have asserted that "[t]he motivation that the Examiner alleges is nowhere suggested in Kodokian or Clark. The Examiner cannot simply make up the motivation" (Appeal Brief, page 7, lines 11-12).

It is true that the Examiner may not "make up" the motivation. We note that there must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the substitutions required. That knowledge cannot come from the applicants' disclosure of the invention itself.

Diversitech Corp v. Century Steps, Inc., 850 F.2d 675, 687-9, 7 USPQ2d 1315, 1318 (Fed. Cir. 1988); In re Gieger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985).

The Examiner has stated that it would have been obvious to one of skill in the art at the time the invention was made to use Clark's nondestructive evaluation method on the bonded laminates of Kodokian because one of ordinary skill in the art would have been motivated to reduce the chances that a defective part is used in an end product (Examiner's Answer, page 6, lines 15-18).

In their Reply Brief, the Appellants note that "[t]here is no indication that Clark's particles can heat and there is no motivation in Clark to reheat them. If the adhesive bond is too weak, Clark needs to scrap the assembly or to break it apart and rebond. Clark is not a thermoplastic welding process" (Reply brief, page 7, lines 22-24).

In order to establish a prima facie case of obviousness, there must be either some suggestion or motivation to modify the references or combine reference teachings and a reasonable expectation of success. In re Vaeck, 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991). In the absence of a reasonable expectation of success, one is left with only an "obvious to try" situation which is not the standard of obviousness under 35 U.S.C. § 103. See In re O'Farrell, 858 F.2d 894, 903, 7 USPQ2d 1673, 1680 (Fed. Cir. 1988).

We note that Clark's Summary of the Invention provides that "[I]t is another object of the present invention to provide a system and method for nondestructively inspecting and monitoring composite materials that indicates the matrix-reinforcement interface integrity" (Column 2, lines 47-50). It appears that both Clark and Kodokian use the same type of ferromagnetic particles. While the Clark particles are not utilized in an identical setting to Kodokian (adhesive bonds are not identical to thermoplastic welds), this teaching is sufficient to bring to one of skill in the art the teaching of utilizing the

ferromagnetic particle analysis method of Clark to analyze the bond of Kodokian, which is a thermoplastic bonding process.

The Appellants have not shown or argued that such a combination would not be expected to work, other than to say there is no indication that Clark's particles can heat. As the Examiner has noted, the particles of both Clark and Kodokian are finely divided ferromagnetic particles, and it is reasonable to assume that they can heat. Thus, we find one of skill in the art making this combination would have a reasonable expectation of success.

The Appellants state at page 7 lines 18-19 that "If Clark uses pulses, those pulses do not travel through the weld to excite a buried metal mesh susceptor in the weld and to cause it to vibrate to generate an acoustic signal". We are not sure what relevance this statement has to the points presently in issue. First, the instant claims do not require the presence of a "buried metal mesh susceptor", they merely require a susceptor to be positioned along the bond line. Second, Clark is not relied upon for illustrating welding, merely the method of analysis. Thirdly, it seems clear from an analysis of Clark, especially figure 2D, that pulses are used.

Continuing to attack the references individually, the Appellants state that Mittleider teaches a multi-pass welding process to avoid overheating of the bond line including rewelding to improve quality, but that electro-acoustic analysis of the weld is not performed. Instead, they argue, Mittleider uses ultrasonic inspection. Finally, the Appellants state baldly that "[c]ombining three references always requires inventive skill or suggests hindsight reconstruction of the invention" (Appeal Brief, page 7, final paragraph).

These arguments do not rebut the prima facie case of obviousness. Mittleider contains an express teaching of rewelding of defects upon detection. The type of detection is not what Mittleider is relied upon for in the rejection, and the Appellants' argument in that regard misses the mark.

Furthermore, there is no per se rule regarding the maximum number of references applied by an Examiner in making a rejection. The criterion is not the number of references, but what they would have meant to a person of ordinary skill in the field of the invention. See, e.g. In re Gorman, 933 F.2d 982, 987, 18 USPQ2d 1885, 1889 (Fed. Cir. 1991) (A large number of cited references [thirteen] does not negate the obviousness of the combination when the prior art uses the various elements for the same purposes as they are used by appellants, making the claimed invention as a whole obvious in terms of 35 U.S.C. §103). Compare Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1383, 231 USPQ 81, 93 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987), the court held that a combination of about twenty references that "skirt[ed] all around" the claimed invention did not show obviousness. See also In re Miller, 159 F.2d 756, 758-58, 72 USPQ 512, 514-15 (CCPA 1947) (rejecting argument that the need for eight references for rejection supported patentability) and Kansas Jack, Inc. v. Kuhn, 719 F.2d 1144, 1149, 219 USPQ 857, 860 (Fed. Cir. 1983) (where teachings relied upon to show obviousness were repeated in a number of references, the conclusion of obviousness was strengthened). Finally, see also In re Troiel, 274 F.2d 944, 947, 124 USPQ 502, 504 (CCPA 1960) (rejecting Appellant's argument that combining a large number of references to show obviousness was "farfetched and illogical").

We see no reason why the combination put forth by the Examiner is improper or would not reasonably be expected to be successful by one of skill in the art. The Appellants have argued a lack of motivation, but the motivation is both express in the references and implied in the knowledge of one of ordinary skill in the art as specifically referenced by the Examiner in the Examiner's answer, page 7, last two lines ("one of ordinary skill in the art would have been motivated to salvage the expensive composite materials rather than discard them").

The teaching, motivation or suggestion to combine or modify the references may be implicit from the prior art as a whole, rather than expressly stated in the references. See WMS Gaming, Inc. v. International Game Tech., 184 F.3d 1339, 1355, 51 USPQ2d 1385, 1397 (Fed. Cir. 1999). The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. See Keller, 642 F.2d at 425, 208 USPQ at 881 (and cases cited therein).

When the Board or an Examiner relies on an express or an implicit showing, it must provide particular findings related thereto. We find that the references contain express teachings and suggestions pointing to:

- 1) the use of ferromagnetic susceptors to inductively heat a pair of fiber reinforced composite laminates and create a thermoplastic weld (Kodokian, e.g. column 5, lines 33-62 and column 6 line 27 - column 7 line 7);

- 2) the desirability of using those same types of ferromagnetic particles to acoustically and nondestructively analyze a composite joint for strength and completeness of binding (Clark, e.g. column 2, lines 47-50); and
- 3) the desirability of inductively rewelding thermoplastically welded areas lacking sufficient strength (Mittleider, e.g. column 19, lines 35-56 and column 21, lines 28-45).

The Examiner has additionally pointed out that one of ordinary skill in the art knows to weld thermoplastic composite parts, nondestructively evaluate the parts, and reweld if unbonded regions are found. The Appellants have not disputed this.

Determination of whether a new combination of known elements would have been obvious to one of ordinary skill depends on various facts, including whether the elements exist in "analogous art", that is, art that is reasonably pertinent to the problem with which the inventor is concerned. In re Deminski, 796 F.2d 436, 442, 230 USPQ 313, 315 (Fed. Cir. 1986). When the references are all in the same or analogous fields, knowledge thereof by the hypothetical person of ordinary skill is presumed, In re Sernaker, 702 F.2d 989, 994, 217 USPQ 1, 5 (Fed. Cir. 1983), and the test is whether the teachings of the prior art, taken as a whole, would have made obvious the claimed invention. See Young, 927 F.2d at 591, 18 USPQ2d at 1091.

We find that 1) the art is analogous and 2) the problem being solved, to wit, the provision of high strength bonds for composite reinforced parts, is the same in all three references. Each of these references was within the general knowledge of one of ordinary skill in the art of fabricating composite structures at the time the invention was made. While the Appellants have focused on the differences in each of the references,

they have failed to take into account the overall teaching to one of skill in the art, which forms the basis of the instant prima facie case of obviousness. It was known at the time the invention was made to inductively weld thermoplastic fiber reinforced materials, to nondestructively evaluate joined materials (using, inter alia, a ferromagnetic acoustic method), and to reweld in areas of incomplete bonding. The Appellants have provided no persuasive arguments that rebut this prima facie case of obviousness, and instead have focused on the individual failings of each reference.

We affirm this rejection.

Summary of Decision

The Rejection of claim 10 over Kodokian in view of Clark is reversed.

The Rejection of claim 10 over Kodokian in view of Clark and Mittleider is affirmed.

Time Period for Response

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR 1.136(a).

AFFIRMED

WILLIAM F. SMITH
Administrative Patent Judge

BRADLEY R. GARRIS
Administrative Patent Judge

JAMES T. MOORE
Administrative Patent Judge

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